RAYS FROM RADIUM FLASH FOR SCIENTISTS AND LAYMEN AT HIGH SCHOOL

QUEER LIGHT SEEN IN DARKENED ROOM.

Professor E. Rutherford of Canada Demonstrates Power of Radio-Activity.

AUDIENCE APPLAUDS.

Flashes Which Travel 20,000 Miles a Second, Penetrate Iron and May Cure Diseases Are Witnessed.

Radium and radio activity were the chief topic of interest to the public and the scientists at yesterday's session of the American Association for the Advancement of Science. The announcement that Professor E. Rutherford of McGill University, Montreal, would give a public lecture, illustrated with experiments, attracted a large number of persons to the Central High School early in the aft-

All of the various sections had finished their sessions in time to allow the members to attend the lecture, and long before the time for the lecture to begin the cuditorium was crowded by those curious to learn of radium and radio activity.

Professor Rutherford is a young man, but he demonstrated to his audience that he was thoroughly informed on the subject of his lecture. He spoke rapidly, so that at times it was hard to follow him through a maze of scientific technicali-ties, but he had little difficulty in keeping his hearers interested throughout the dis-

ether other substances would act like inium, and she found that thorium illarly. Later, she found that pitch blende, an ore, found most largely in Austria, possessed these properties in a ery high degree; much greater, in fact, than would be possessed either by pure grantum or therium. She attributed this increased activity to a new substance which she called radium. She found that the radiated power varied directly with the amount of radium present, and not at all on the degree of concentration of the

TEN-MILLIONTH OF TON. The preparation of radium from the process. From one ton of the original maonly about on ten-millionth renains. It is on this account that radium

mains. It is on this account that radium is so expensive, but because of its wonderful power very inte of it produces very noticeable results.

"Since the discovery of radium two new substances, called pollonium and actinium, aving properties similar to radium, have in discovered. Pure radium has a radial two power between one and two million times that of pure uranium.

"The radiations from radium are not ordinarily rishle. A feeble glow is the sign of purity. The radiations may be detected by the florescence produced by them on an X-ray screen or in willemite, an ore or zinc." This was illustrated by experiments conducted in the darkened anditorium.

itorium.

adium produces three kinds of rays manations," continued Professor Ruthret, "which are called the aipha, beta gamma rays. The aipha rays are ated in one direction, the beta rays he other, when a magnet is placed in reighborhood. The gamma rays are deviable. The beta rays are very lar to the cathode rays, produced by electric discharge through rarified atter negatively electrified, and mov-

an electric discharge through rarified maters. They consist of very small particles of matter negatively electrified, and moving with a speed equal to half that of light! J. I Thompson estimates that the size of these particles is one-one thousandth that of an atom of hydrogen.

The alpha rays have different properties and are the most important. They consist of particles of matter about the size if a hydrogen atom and are positively lectrified. They move with the speed of bout 20,000 miles a second. Their presmes may be detected by an instrument allied the spinthariscope, in which the mail particles are made to strike a screen mated with supplied of inc. Under the shence of the bombardment of particles, across glitters with particles of light."

Professor Rutherford was unable to constrate this because he did not have obthinariscope, he had to use the stere-licon as a substitute. The sildes were arranged that the effect of the rays alting the screen gave off brilliant of the street arranged that the effect of the rays alting the screen gave off brilliant of the street arranged of the gave off brilliant of the street arranged of the screen gave off brilliant of the screen gave off brilliant of the street arranged of the screen gave off brilliant of the screen gave o

PENETRATING IRON.

In the lantern slide illustration the action of an individual atom was witnessed, the atom throwing off parts of itself, represented by the particles of light, indi-cating the presence of the alpha rays. The alpha rays are very penetrating and similar to the X-rays. This was dem-onstrated by Professor Rutherford, who showed that the alpha rays penetrated an iron plate two inches thick.

Another important property of radium is the gaseous emanation that it diffuses, which are like the gases of the arron

Another important property of radium is the gaseous emanation that it diffuses, which are like the gases of the argon family. Professor Rutherford then raised the question whether these emanations are material, and said that they are, because they can be condensed by cold.

"To prove this, Professor Rutherford heated a tube containing radium, making emanations. The emanations were carried to an electroscope through a tube, and discharged the electroscope.

Professor Rutherford has discovered that one grain of radium gives off 199 gram calories an hour. The heat of radium is very great, and Professor Rutherford said that one pound of radium would generate 199,000-horse-power. These effects of radium are produced by some sort of chemical or atomic charge, and, therefore, the energy produced by radium comes from litself.

"One month after losing the emanations," continued the professor." "radium aradial-

cal or atomic charge, and, therefore, the energy produced by radium comes from liself.

"One month after losing the emanations," continued the professor, "radium gradually recovers its radio-active power, while the emanation loses power just as fast as radium recovers. Then the total power of radium is constant. After the alpha rays are expelled the emanations are left. The emanation produces another kind of matter, which in turn produces excited activity. Then three kinds of matter are produced in succession.

"The fourth change produces pollonium, while the final product is either helium or hydrogen, although it is not known definitely which. Evidence for the breaking up of atoms is found in the fact that radium has been radiating since creation. The alpha particles given off are either helium or hydrogen, helium always being found near radio-activity substances.

"Each change forms a definite product. Then the transmutation is spontaneous. It goes on immutably. It is not probable that we can control it. If we could, a li-rge amount of power would be available from a minute quantity of radium."

As to its medical uses, Professor Rutherford said that it is a partial cure for cancer, while on the question of whether it is a cure for consumption there is much speculation, but little definite knowledge.

After the lecture the professor was surrounded by an eager crowd that thronged about in an effort to get a closer view of radium.

PROFESSOR LEWIS HAUPT

PROFESSOR LEWIS HAUPT

appear that the transient designage of the bars does not fall within the requirements of creating a permanent channel, nor does it operate to prevent destructive floods."

"But 'self-preservation is the first law of nature' and the local belief in the efficiency of embankments for 'the purpose of reclaiming lands or preventing injury to the lands or private property from overflow,' is so innate that the occupants of such tracts are aimost a unit in their demands for national aid for protection and not without reason, since they have a right to be protected in their lives, homes and property from the ravages of a common enemy from without. Since, under existing conditions there appears to be no warrant for the application of the funds to reclamation works pure and simple, the law should be amended and an appropriation should be made directly for this purpose independently of the commercial or navigation requirements.

"The lands thus reclaimed are amongst the most fertile and desirable within the Federal domain and would become the source of a large volume of staple commodities for manufactures and food products. There is quite as strong an argument for the development of this portion of our territory by the exclusion of floods and their devastations at the expense of the general Government as there is for the fertilization of the arid lands of the western plains by the application of irrigation. While one section has too much water at certain seasons the other was too little, and it is unquestionably the function of a paternal government to equalize and regulate the distribution of this life-giving element for the general welfare.

"To this extent and for this purpose levees are unquestionably useful, yet they are not the only resource of the engineering profession in alleviating floods and recialming lands. Drainage is an important factor and this is based upon the principle of drawing down the water by gravity to lower levels and voiding it as rapidly as the topography will permit, but this important exped en

THE OUTLET SYSTEM. "There has been much misunderstanding as to the practical application of this sys-

"There has been much misunderstanding as to the practical application of this system, and erroneous impressions prevail as to its results in consequence of the deductions drawn from natural crevasses.

"As the discharge from these openings returns to the main trunk lower down, through the tributaries, where the confluence of waters further obstructs the flow and causes deposits, it is chaimed that outlets would be harmful. But this is not the condition which would prevail if properly constructed weirs and regulating works were placed so as to permit the discharge of a portion of the excess of the floods into suitably located impounding reservoirs, remote from the erosive action of the river currents.

"It is also claimed that the navigable channel would be injured by the reduction of volume below the crevasses, and that the bed would rise in consequence thereof. This conclusion does not appear to be sustained either in theory or practice. On this point Generals Humphreys and Abbot state (page 37. "Physics and Hvdraulics"), under the head of Outlets: This plan consists in reducing the flood discharge by waste-weirs, and conveying the surplus water to the Gulf by channels other than that of the main river.

"The advantages of this system have been stoutly contested by many writers on the ground that reducing the discharge



PROFESSOR E.DWIGHT SANDERSON.



DR. L. O. HOWARD.

Three distinguished attendants at the meeting of the American Association for the Advancement of Science, Mr. Wright is United States Labor Commissioner; Professor Sanderson occupies the chair of entomology at the Agricultural College of Texas, and Doctor Heward is Chief of the Bureau of Entomology at Washington.

out to a mile in breadth, the bed shoals to about six fathoms at the head of the Passes, which may be regarded as three crevasses and yet it will be found that in each one of these distributaries the depths exceed those of the undivided atream. In the Fass a Loutre it is twelve, in South Pass ten and in Southwest Pass tibirteen fathoms, with no bottom, all at the points of incidence of the divided currents. Again in the Pass a Loutre at the cravasses, which formed in 1891, the depth abreast the opening is thirteen fathoms and one mile below it is fourteen and one-half. This same stream again divides in-lo iwo main banches, showing eight and one-half. This same stream again divides in-lo iwo main banches, showing eight and one-half along the sharper concavity of the Southeast Pass, due to reaction of the bank. Without further claboration, the same general results may be seen wherever a crevasse occurs and there is no indication of shoaling due to the escape of the excess of the flood waters or loss of volume.

"On the other hand, there is a very marked benefit observable in the relief afforded to the stream, for these openings enable it to discharge a large portion of its sediment beyond the banks and out of the highway of commerce, which must otherwise be carried to the Gulf and be dropped directly across the channel, thus extending the trough, reducing the slove and increasing the height of the floods. In fact, a former Chief Engineer of the State of Louisiana stated that the reason for selecting the southwest Pass for improvement was because of its greater general depth, so that the shoaling, which must create from the extension of the channel four miles by the two jettles, would not so soon affect the navigable depths, in copy-quence of the contraction of the out.

"As stready stated, similar results have taken place in the South Pass above the jettles, where the fill in one place has exceeded fourty feet. But these lateral outlets also play an important part in the recipient of the savery made by a Mr. Chuc

"A better idea of the extent of this co bution to the wealth of the nation may be obtained by computing the cost of sebe obtained by computing the cost of se-curing it by the usual method of back-filling by the use of hydraulic dredging at, say, 10 cents per cubic yard, and assum-ing the average depth to be nine feet On this basis the total fill would aggrerate some 400,000,000 cubic yards in the thirty years, or over 13,052,000 cubic yards per year. The total cost of securing this re-sult by dredging, regardless of time, would therefore represent \$40,000,000 for this one crevases.

"At 'the Jump,' where 112 square miles



COMPLETELY CURED CANCER.

New York, Dec. 30.-Radium is reported to have removed a cancer which ♦ spread over the entire right cheek of William Hoffman, 62 years old, of New ark, N. J. When he came here for treatment several specialists expressed the
 belief that the growth could be removed only by cutting away nearly all the

of radium and experimented by placing it in the patient's mouth. He reports . ♦ that Hoffman complained of a burning sensation in the check, which became ♦ unendurable after forty minutes. The swelling began to go down immediately
 and the growth began to disappear after the treatment had been continued a

A stronger tube was procured from Paris and, at the end of six weeks, the . cancer is said to have entirely disappeared, leaving the cheek in its normal

and Abbot at 25,000,000 yards, it represents 13 per cent of the whole; while the annual deposit at Cubitt's Gap is 5 per cent, making about one-sixth of the zell-ment which is thus withdrawn by these crevasses with consequent benefit to navigation, reduction of flood height and increase of the public domain, all without cost.

igation, reduction of flood height and increase of the public domain, all without cost.

"It would therefore sem that these lateral outlets have very much to commend them to the consideration not only of engineers but of economists, business men, farmers and real estate dealers, and that so far as the evidence of nature goes their operation is only beneficial and in novise injurious. If they were closed and the river leveed, all of the advantages named would be destroyed and the sediment would be carried to the mouth, where it would extend the bars more rapidly, raise the flood-plain and require clevation of the entire system of levees along the river banks.

"But there is another class of outlets which may be considered in this conpection and that is the bars which obstruct the mouths and thus prevent the free discharge of the flovial waters. These may be distinguished as longitudinal outlets, and their permanent removal is entirely practicable by applying the energy of the river to the work to be done.

SEDIMENTARY STREAMS.

"It is a well known fact that a sedimen-

"It is a well known fact that a sedimentary stream, flowing through a straight reach, seldom maintains a single permanent channel, while in swinging around curves the concave bank, acting as the directrix, causes a reaction which deepens the bed and deposits the silt upon the complementary, convex bank which is the resultant of this action. In this way, by the operation of natural laws, the deposits are removed from the path of navigation and the cross-section is automatically adjusted to the requirements of the river. Instead, therefore, of building two parallel jettles as substitutes for the natural banks and thus extending the river into the Gulf at the expense of its slope and the reduction of its area of discharge along straight lines, which are unnatural and unfavorable, it will be found more rational to build one curved training wall, so placed as to create a head and reaction, which will transport the silt to the opposited without cost, leaving an ample navigable channel and saving the expense of one of the jettles, while it also scours away the bar directly in front of the mouth and affords an open passage for the effluent water.

"By thus utilizing the tendency of water to flow in curved lines, instead of straight ones, half the cost of the firty works may be saved and a better and more permanent channel be obtained, with a lowering of the flood heights of the river. This result is due to the form of the orifice thus created, and it will be seen that when no such modification is applied the effluent stream is abruptly clacked by the inertia of the Gulf water and the sediment thus deposited acts as a buffer to divide and deflect the energy into lateral components, which are again subdivided indefinitely, as shown in the typical forms of the deposities at Cublit's Gap, whereas when supported and concentrated by the continuous reaction of a property-piaced reats thus generated will prevent depositionent thus generated will prevent depositionent be set for the dump. These features may tary stream, flowing through a straight reach, seldom maintains a single per-

rents thus generated will prevent deposits near the trace of the work and create a neutral zone or counterscarp at some distance therefrom, which will thus become the site for the dump. These features may be observed wherever there are obstacles placed in the path of a current. The best artificial flusuration of the efficiency of this principle as applied to a tidal inlet, with a feeble tide, is to be found at Aransas Pass, Tex.

"The lowering of the flood plain by the removal of the barriers to the longitudinal discharge is also well litustrated by the opening on the River Tyne in England, where the flood heights have been reduced from 9 to 3 feet along the stream, by the opening of the mouth and removal of the lars from the bed.

"Regardless, therefore, of the interests of navigation, it would be of great benefit to the State and Nation to open the nouths of all the passes for drainage and

"In the foregoing analysis it has been the intention to lay particular stress upon the necessity of so regulating the movethe necessity of so regulating the move-ments of the sediment as to prevent its being deposited in the pathway of the stream, where it may operate to obstruct its flow, causing elevation of bed, banks, levees and greater risks and expense, for it is evident that so long as the com-mingled earth and water are confined to the channel with no avenues of escape the deposits must engorge the bed and involve continuous danger and expense.

"It would seem that the attention of the engineering profession has been for

cussed mainly upon the control of the water, apart from its sediment, and with secondary consideration to the evils resulting from failure to separate these two elements, which, it is believed, may be done to great advantage at a number of points en ruote, where lands may be reclaimed by the natural process of hydraulic grading and large tracts of the richest arable land be reclaimed in a comparatively short time at a cost which will be insignificant as compared with that required to grade and drain it by mechanical means.

"It is, therefore, desired to direct particular attention to the necessity of providing suitable dumping sites for the mud carried seaward by the river in times of flood, where it may be deposited beyond the banks of the stream without injury, through or over suitable weirs and be retained by impounding dikes in the low, swampy regions to their advantage.

"The question is similar in its general features and effects to that prevailing at the infots along alluvial coasts, where it was the practice to attempt the removal of the bars by jettles in pairs supplemented by dredging, but which method has not been able to meet fully the demands of modernwessels, so that recourse is now being had to the control of the heavier earthy materials which compose these obstructions in such manner as to protect the channels from their encroachments and cause the single concave fetty to construct and maintain much greater depths than exist in a state of nature."

PROFESSOR SANDERSON ON COTTON BOLL WEEVIL

Professor E. Dwight Sanderson, in a paper on "The Mexican Cotton Boll Weevil n Texas," discussed the life history of the pest, the injury done by it to the cotton crop in the States in the cotton belt. and pointed out that sprays and ma-chines to exterminate the insect are val-

The remedy he suggested he called an and remote the suggested he called an educational one, in bringing about a better cotton culture and more intelligent culture in general. Professor Sanderson is professor of entomology at the Agricultural and Mechanical College of Texas, and his paper, which was read before the Entomological Section, was interesting

the Entomological Section, was interesting.

Professor Sanderson said:

"In 1991 Congress made a special appropriation for the Division of Entomology to again take up the study of the boil weevil, as its northward and eastward spread menaced adjoining cotton States. In 1991 Mr. Hunter was placed in charge of the work and a laboratory was established at Victoria. In 1992 under renewed appropriation, Mr. Hunter contracted with the proprietors of two large farms, one at Victoria and another at Calvert, upon which the cotton was to be grown according to his directions, the department guaranteeing a certain crop per acre and paying extraordinary costs. This arrangement was highly satisfactory and in 1993 six farms, distributed over the principal cetton districts of the State, were thus operated.

"It is now proposed to operate a large number of such farms by the Department

In 1904 along the lines demonstrated to be successful by the Division of Entomology and the statistical properties of the statistic properties

Southern entemologist may devoutly pray that he be allowed to wash his hands entirely.

SPRAYS ARD VALUELESS.

"All machines, sprays, noxitons, etc., have proven of little or no value, owing to the habits of the weevil; none are being recommended by us, and there seems brought forward. The Legislature of Techas has offered a reward of \$8,000 for a remedy for the weevil, providing its application costs not ever si per acre, but which is so hedged around with provisos that it is decidedly improbable that it will be awarded. Furthermore, the method infinite for the State and patent ingly poor business proposition for the content of the State and patent ingly poor business proposition for the post has done much to delay the more general adoption of the cultural methods now agreed as being successful for avoiding injury. The faith of the average farmental to device means of combating such a pest is indeed fattering to the latter, but is discouraging when he appreciates the impossibility of meeting the expectations of the farmer, who is slow to realize that a remedy per se is not necessary, and although the entomologist may have contrasted how a profit high possibility of meeting the expectations of the farmer, who is slow to realize that a remedy per se is not necessary, and additionally the entomologist may have contrasted how a profit high possibility of meeting the expectations of the farmer, who is slow to realize that a remedy per se is not necessary, and a contrast of the survey of the solution of the farmer, who is slow to realize that a remedy per se is not necessary, and though the entomologist may have contrasted how a profit high possibility of meeting the expectations of the farmer, who is slow to realize that a remedy per se is not necessary, and a contrast the province of the call through the province of the survey of the solution of the call familiar.

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it has been my chief work for the last year and has seemed by the peciple and appreciated by them by the peciple and appreciated by them.

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FATHER BRENNAN SHOWS PROGRESS OF ASTRONOMY.

Much attention was attracted to the paper prepared and read by the Reverend Martin S. Brennan, A. M. Sc. D., on the progress of astronomy in the United States.

Father Brennan, who is paster of St. Lawrence O'Toole's Catholic Church, St. Louis, has an international reputation as an astronomer and is the author of several works on that subject.

In his sketch yesterday he said in part:
The systematic cultivation of practical astronomy in the United States is of comparatively recent date.
The first real impulse toward its ad-

Late arrivals at the convention of scientists yesterday were as follows:
Percival Lewis, Berkeley, Cal.
J. C. Cooper, Topeka, Kas.
C. Willard Hayes, Washington, D. C.
Frederick E. Wrisht, Houghton, Mich.
Maurice Ricker, Burlington, In.
E. A. Kirkpatrick, Fitchburg, Mass,
S. F. Emmons, Washington, D. C.
Albert B. Reagan, Birmington, Ind.
H. C. Wilson, Northfield, Minn,
C. R. Van Hise, Madison, Wis.
R. J. Burrill, Urbana, Ill.
C. D. Marlatt, Washington, D. C.
H. L. Bietz, Urbana, Ill
Frederick L. Ransome, Washington,
D. C.

H. L. Rietz, Urbana, Ili
Frederick L. Ransome, Washingto
D. C.
Raiph S. Farr, Ithaca, N. Y.
I. P. Simpson, Palmer, Ill.
R. H. McKee, Lake Forest, Ill.
Charles Bobertson, Carlinville, Ill.
Charles H. Ashton, Lawrence, Kas.
Benjamin W. Snow, Madison, Wis.
H. Diemer, Lawrence, Kas.
G. M. Tucker, Columbia, Mo.
C. H. Hughes, St. Louis.
S. W. Williston, Chicago,
W. A. McBeth, Terre Haute, Ind.
George E. McClure, St. Louis,
George Frederick Wright, Oberlin, O.
O. M. Oleson, Fort Dodge, Ia.
A. C. Bernaye, St. Louis.
C. L. Mees, Terre Haute, Ind.
Carl Bark, St. Louis.
Robert Moore, St. Louis.
Adolph Alt, St. Louis.
John S. Wright, Indianapolia.